In re Application of: Hanan KEREN et al
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Examiner: Patricia C. MALLARI
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In the Claims:

1-74. (Canceled)

75. (Currently Amended) A system for measuring blood flow in an organ of a subject, the system comprising:

a radiofrequency generator for generating output radiofrequency signals;

a plurality of electrodes, designed to be connectable to the skin of the subject, said electrodes being for transmitting said output radiofrequency signals to the organ and for sensing input radiofrequency signals of the organ;

a mixer, electrically communicating with said radiofrequency generator and at least a portion of said plurality of electrodes, for mixing said output radiofrequency signals and said input radiofrequency signals, so as to provide a mixed radiofrequency signal radiofrequency sum and a radiofrequency difference and being indicative of the blood flow; and

electronic circuitry, constructed and designed to filter out a portion of said mixed radiofrequency signal ~~so as to substantially increase a signal-to-noise ratio of a remaining portion of said mixed radiofrequency signal~~.

76. (Canceled)

77. (Currently Amended) The system of claim 75~~76~~, wherein said electronic circuitry comprises a low pass filter for filtering out said radiofrequency sum.

78. (Withdrawn) The system of claim 75, wherein said electronic circuitry comprises an analog amplification circuit for amplifying said remaining portion of said mixed radiofrequency signal.

79. (Previously Presented) The system of claim 75, wherein said electronic circuitry comprises a digitizer for digitizing said remaining portion of said mixed radiofrequency signal.

80. (Previously Presented) The system of claim 75, wherein said electronic circuitry is designed and constructed so as to minimize sensitivity of said input radiofrequency signals to impedance differences between said plurality of electrodes and the organ of the subject.

81. (Currently Amended) The system of claim 80, wherein said electronic circuitry comprises at least one differential amplifier characterized by an impedance being ~~substantially~~ larger than said impedance differences between said plurality of electrodes and the organ of the subject.

82. (Previously Presented) The system of claim 75, further comprising a data processor for calculating at least one quantity using said remaining portion of said mixed radiofrequency signal, said at least one quantity being selected from the group consisting of a stroke volume, a cardiac output, a brain intra luminal blood flow and an artery blood flow rate.

83. (Previously Presented) The system of claim 82, wherein said artery blood flow rate is selected from the group consisting of an external carotid blood flow rate, an internal carotid blood flow rate, an ulnar blood flow rate, a radial blood flow rate, a brachial blood flow rate, a common iliac blood flow rate, an external iliac blood flow rate, a posterior tibial blood flow rate, an anterior tibial blood flow rate, a peroneal blood flow rate, a lateral plantar blood flow rate, a medial plantar blood flow rate, a deep plantar blood flow rate.

84. (Previously Presented) The system of claim 82, further comprising a pacemaker, communicating with said data processor and operable to

control a heart rate of the subject, wherein said data processor is programmed to electronically control said pacemaker, in accordance with a value of said at least one quantity.

85. (Withdrawn) The system of claim 82, further comprising a drug administrating device, communicating with said data processor and operable to administrate drugs to the subject, wherein said data processor is programmed to electronically control said drug administrating device, in accordance with a value of said at least one quantity.

86. (Withdrawn) The system of claim 82, further comprising a cardiac assist device, communicating with said data processor and operable to increase said cardiac output.

87. (Withdrawn) The system of claim 86, wherein said cardiac assist device comprises a reinforcing member designed and configured to restrict an expansion of a portion of a heart tissue, thereby to increase said cardiac output.

88. (Previously Presented) The system of claim 75, wherein a number of said plurality of electrodes is selected so as to substantially decouple said input radiofrequency signals from at least one effect selected from the group consisting of a posture changes effect, a respiration effect and a motion effect.

89. (Previously Presented) The system of claim 75, wherein said plurality of electrodes comprises two electrodes.

90. (Previously Presented) The system of claim 75, wherein said plurality of electrodes comprises three electrodes.

91. (Previously Presented) The system of claim 75, wherein said plurality of electrodes comprises four electrodes.

92. (Currently Amended) The system of claim 75, wherein at least a portion of said plurality of electrodes are designed and constructed ~~to~~ so as to have a substantial constant sensitivity to electrical signals transmitted through said electrodes, irrespectively of an orientation of said electrodes on the subject.

93. (Currently Amended) The system of claim 75, wherein at least a portion of said plurality of electrodes comprises at least one elongated conducting material constructed and designed to wind at least a portion of an external organ of the subject, so as to have a ~~substantial~~ constant sensitivity to electrical signals transmitted through said electrodes, irrespectively of an orientation of said electrodes on said external organ.

94. (Currently Amended) The system of claim ~~93~~75, wherein at least a portion of said plurality of electrodes comprises an attaching material.

95. (Currently Amended) The system of claim ~~93~~94, wherein said external organ is selected from the group consisting of a chest, a hip, a thigh, a neck, a head, an arm, a forearm, an abdomen, a gluteus, a leg and a foot.

96. (Currently Amended) The system of claim 75, further comprising a bioimpedance detector electrically communicating with at least a portion of said plurality of electrodes for detecting a voltage between a first location and a second location of the subject and for generating said input radiofrequency signals in response to said voltage, wherein said input radiofrequency signals are~~being~~ indicative of impedance of the organ.

97. (Previously Presented) The system of claim 96, further comprising at least one sensor for sensing said voltage, said at least one sensor being constructed and designed for generating signals having a magnitude which is a function of blood flow in, from or to the organ.

98. (Previously Presented) The system of claim 96, wherein said electronic circuitry comprises a differentiator for performing at least one time-differentiation, to provide a respective derivative of said impedance between said first and said second locations.

99. (Previously Presented) The system of claim 98, wherein said derivative is selected from the group consisting of a first derivative and a second derivative.

100. (Previously Presented) The system of claim 98, wherein said differentiator is selected from the group consisting of a digital differentiator and an analog differentiator.

101. (Previously Presented) The system of claim 75, further comprising a display device for displaying the blood flow.

102. (Previously Presented) The system of claim 101, wherein said display device is capable of displaying the blood flow as a function of time.

103. (Currently Amended) The system of claim 75, wherein said electronic circuitry is constructed and designed to filter out said portion of said mixed radiofrequency signal such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 10dB.

104. (Currently Amended) The system of claim 75, wherein said electronic circuitry is constructed and designed to filter out said portion of said mixed radiofrequency signal such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 20dB.

105. (Currently Amended) An apparatus for determining blood flow in an organ of a subject, the apparatus having a radiofrequency measuring unit, the radiofrequency measuring unit is capable of transmitting output radiofrequency signals to the organ and receiving input radiofrequency signals of the organ, the apparatus further comprising:

(a) a mixer, electrically communicating with said radiofrequency measuring unit, for mixing said output radiofrequency signals and said input radiofrequency signals, so as to provide a mixed radiofrequency signal having radiofrequency sum and a radiofrequency difference and being indicative of the blood flow; and

(b) electronic circuitry, constructed and designed to filter out a portion of said mixed radiofrequency signal ~~so as to substantially increase a signal-to-noise ratio of a remaining portion of said mixed radiofrequency signal~~.

106. (Canceled)

107. (Currently Amended) The apparatus of claim ~~106~~105, wherein said electronic circuitry comprises a low pass filter for filtering out said radiofrequency sum.

108. (Withdrawn) The apparatus of claim 105, wherein said electronic circuitry comprises an analog amplification circuit for amplifying said remaining portion of said mixed radiofrequency signal.

109. (Previously Presented) The apparatus of claim 105, wherein said electronic circuitry comprises a digitizer for digitizing said remaining portion of said mixed radiofrequency signal.

110. (Previously Presented) The apparatus of claim 105, wherein said electronic circuitry is designed and constructed so as to minimize sensitivity of said input radiofrequency signals to impedance differences between said plurality of electrodes and the organ of the subject.

111. (Previously Presented) The apparatus of claim 110, wherein said electronic circuitry comprises at least one differential amplifier characterized by an impedance being substantially larger than said impedance differences between said plurality of electrodes and the organ of the subject.

112. (Previously Presented) The apparatus of claim 105, wherein said electronic circuitry comprises a differentiator for performing at least one time-differentiation, to provide a respective derivative of an impedance between a first location and a second location of the body of the subject.

113. (Previously Presented) The apparatus of claim 112, wherein said derivative is selected from the group consisting of a first derivative and a second derivative.

114. (Previously Presented) The apparatus of claim 112, wherein said differentiator is selected from the group consisting of a digital differentiator and an analog differentiator.

115. (Currently Amended) The apparatus of claim 105, wherein said electronic circuitry is constructed and designed to filter out said portion of said mixed

radiofrequency signal such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 10dB.

116. (Currently Amended) The apparatus of claim 105, wherein said electronic circuitry is constructed and designed to filter out said portion of said mixed radiofrequency signal such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 20dB.

117. (Currently Amended and Withdrawn) A method of measuring blood flow in an organ of a subject, the method comprising:

generating output radiofrequency signals;

transmitting said output radiofrequency signals to the organ and sensing input radiofrequency signals of the organ;

mixing said output radiofrequency signals and said input radiofrequency signals, so as to provide a mixed radiofrequency signal having a radiofrequency sum and a radiofrequency difference and being indicative of the blood flow; and

filtering out a portion of said mixed radiofrequency signal ~~so as to substantially increase a signal-to-noise ratio of a remaining portion of said mixed radiofrequency signal, thereby measuring the blood flow~~.

118. (Canceled)

119. (Currently Amended and Withdrawn) The method of claim ~~118~~117, wherein said filtering said portion of said mixed radiofrequency signal is by a low pass filter constructed and designed for filtering out said radiofrequency sum.

120. (Withdrawn) The method of claim 117, further comprising analogically amplifying said remaining portion of said mixed radiofrequency signal.

121. (Withdrawn) The method of claim 117, further comprising digitizing said remaining portion of said mixed radiofrequency signal.

122. (Withdrawn) The method of claim 117, wherein said electronic circuitry is designed and constructed so as to minimize sensitivity of said input radiofrequency signals to impedance differences between said plurality of electrodes and the organ of the subject.

123. (Withdrawn) The method of claim 122, wherein said electronic circuitry comprises at least one differential amplifier characterized by an impedance being substantially larger than said impedance differences between said plurality of electrodes and the organ of the subject.

124. (Withdrawn) The method of claim 117, further comprising calculating at least one quantity using said remaining portion of said mixed radiofrequency signal, said at least one quantity being selected from the group consisting of a stroke volume, a cardiac output and a brain intra luminal blood volume and an artery blood flow rate.

125. (Withdrawn) The method of claim 124, wherein said artery blood flow rate is selected from the group consisting of an external carotid blood flow rate, an internal carotid blood flow rate, an ulnar blood flow rate, a radial blood flow rate, a brachial blood flow rate, a common iliac blood flow rate, an external iliac blood flow rate, a posterior tibial blood flow rate, an anterior tibial blood flow rate, a peroneal blood flow rate, a lateral plantar blood flow rate, a medial plantar blood flow rate, a deep plantar blood flow rate.

126. (Withdrawn) The method of claim 124, further comprising controlling a heart rate of the subject in accordance with a value of said at least one quantity.

127. (Withdrawn) The method of claim 126, wherein said controlling a heart rate of the subject is by a pacemaker.

128. (Withdrawn) The method of claim 124, further comprising using a value of said at least one quantity for selecting an amount and a type of drugs and administrating said amount and said type of drugs to the subject.

129. (Withdrawn) The method of claim 124, further comprising providing a site of surgical access to a portion of a heart of a subject and maintaining the reduction of cardiac expansion of said portion of said heart a substantial amount of time so as to increasing said cardiac output.

130. (Withdrawn) The method of claim 117, wherein said transmitting said output radiofrequency signals to the organ and sensing said input radiofrequency signals of the organ is by connecting a plurality of electrodes to the skin of the subject.

131. (Withdrawn) The method of claim 130, wherein a number of said plurality of electrodes is selected so as to substantially decouple said input radiofrequency signals from at least one effect selected from the group consisting of a posture changes effect, a respiration effect and a motion effect.

132. (Withdrawn) The method of claim 130, wherein said plurality of electrodes comprises two electrodes.

133. (Withdrawn) The method of claim 130, wherein said plurality of electrodes comprises three electrodes.

134. (Withdrawn) The method of claim 130, wherein said plurality of electrodes comprises four electrodes.

135. (Withdrawn) The method of claim 130, wherein said connecting said plurality of is done so as to have a substantial constant sensitivity to electrical signals transmitted through said electrodes, irrespectively of an orientation of said electrodes on the subject.

136. (Withdrawn) The method of claim 130, wherein at least a portion of said plurality of electrodes comprises at least one elongated conducting material constructed and designed to wind at least a portion of an external organ of the subject, so as to have a substantial constant sensitivity to electrical signals transmitted through said electrodes, irrespectively of an orientation of said electrodes on said external organ.

137. (Withdrawn) The method of claim 136, wherein said external organ is selected from the group consisting of a chest, a hip, a thigh, a neck, a head, an arm, a forearm, an abdomen, a gluteus, a leg and a foot.

138. (Withdrawn) The method of claim 117, further comprising detecting a voltage between a first location and a second location of the subject and generating said input radiofrequency signals in response to said voltage, wherein said input radiofrequency signals being indicative of impedance of the organ.

139. (Withdrawn) The method of claim 138, further comprising performing at least one time-differentiation thereby providing a respective derivative of said impedance between said first and said second locations.

140. (Withdrawn) The method of claim 139, wherein said derivative is selected from the group consisting of a first derivative and a second derivative.

141. (Withdrawn) The method of claim 139, wherein said performing said time-differentiation is effected by a procedure selected from the group consisting of a digital differentiation and an analog differentiation.

142. (Withdrawn) The method of claim 117, further comprising displaying the blood flow using a display device.

143. (Withdrawn) The method of claim 142, wherein said display device is capable of displaying the blood flow as a function of time.

144. (Currently Amended and Withdrawn) The method of claim 117, wherein said filtering is performed such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 10dB.

145. (Currently Amended and Withdrawn) The method of claim 117, wherein said filtering is performed such as to increase a signal-to-noise ratio of said remaining portion ~~is increased~~ by at least 20dB.